isms, was not the only interpretation which could explain the absence of typhoid colonies upon the gelatin plates. This might also legitimately be attributed to the imperfect procedures practiced by the author for isolating the typhoid organism from the mixture. It was easy for him to determine which of these two hypotheses accorded best with his results. For this it was sufficient to make control plates, and to seek for the typhoid bacillus, not after five, ten, or fifteen days of symbiosis with the colon bacillus, but at the very moment of making the mixture. We are convinced that with the aid of ordinary gelatin he would have experienced the same difficulty as in the other case. He could at the same time have replanted colonies appearing upon the plates made with the mixtures five, ten, and fifteen days after their preparation, and then he would have certainly been able to see that the typhoid bacilli survived perfectly in association with the colon bacillus.

Another reason lead us to undertake these experiments upon the antagonism between the typhoid and colon bacilli. The study of the modifications which symbiosis might bring about in these two organisms has never been made; it was interesting, therefore, to undertake the researches from this point of view, and our differential gelatin permitted us to supply this deficiency.

Experiment 1. We used the colon bacillus and the typhoid bacillus isolated from the stool of case No. 20. Method of procedure: In a flask of 2 liters capacity, containing 1 liter of peptonized water (Witte's peptone, 3 per cent, N_2CL 10.5 per cent, and reaction exactly neutral, we planted on July 7, 5 c. c. of a twenty-four hour old bouillon culture of B. coli communis, and 5 c. c. of a typhoid culture of the same age. After shaking, the flask was left at room temperature, 22° to 27° C. The same process under the same conditions was repeated on a flask of peptonized water acidified by sulphuric acid after previous neutralization, to the extent of 0.5 per cent.

For the sake of clearness and conciseness we will designate by—

E. Culture in neutral peptonized water.

H. Culture in acidified peptonized water.

B. t. s. 20.—The typhoid bacillus from the stool of case No. 20.

B. c. s. 20.—The colon bacillus from the stool of case No. 20.

Characteristics of the colon and typhoid bacilli before symbiosis.

B. c. s. 20.—Gives indol, ferments lactose energetically, and is slightly motile.

B. t. s. 20.—Was very motile, and was agglutinated in dilution of 1–70000 by the experimental antityphoid serum.

After a variable number of days of symbiosis, we made with the mixture, by means of the differential gelatin, plates as follows:

First dilution, 1 loopful of the previously shaken mixture in 10 c. c. of distilled water;

Second dilution, 1 loopful of No. 1 in 10 c. c. of distilled water, and

1, 2, and 3 loopfuls of this dilution were used, respectively, to make 3 plates with gelatin.

For each examination we picked out 10 colon and 10 typhoid colonies; the colonies were differentiated by means of the characteristics of the organisms as detailed above, viz: Gas, indol, agglutination.

Résumé of results obtained by planting the mixture.

July 12, first planting.—Development of typhoid and colon colonies on the 14th. On the 18th we counted on plate No. 1 (1 loop of the second dilution) 100 colonies, of which, approximately, 50 were colon and 50 were typhoid, both in the case of flask E and flask H.

Characteristics of the organisms after symbiosis of five days.

B. coli.—The characteristics were preserved.

B. typhosus.—Those which were isolated from the neutral or acid flask have sensibly lost their power of reaction to the agglutinins; even in dilution of 1–10 they were not agglutinated by the serum which had previously been active in the dilution of 1–70000. These have been preserved in our collection under the mark tH1 and tE1.

July 23.—Another planting with similar results:

August 3.—Third planting; results:

The typhoid colonies only appear on the fourth day. They preserve their whitish blue appearance, but remain smaller than in previous plantings. They diminish in number in proportion to the colon colonies (50t. to 70c.). The colon colonies are also smaller than formerly; furthermore, certain ones are small, bluish, and they approach in appearance the colon colonies, with which they might be confounded were one not on his guard. It is always prudent to replant a certain number for study, to be convinced of their colon nature.

The colon and typhoid organisms have the same characteristics as those which we had demonstrated after five days of symbiosis. They were preserved under the marks tH2 and tE2.

The fourth planting (August 22) and the fifth (September 9) show nothing in particular.

The sixth planting (September 29).—Development of colonies on October 4. The number of colonies has considerably diminished. On plate No. 2, were counted—total number, 85; colon, 60; typhoid, 25.

Characteristics of the organisms after eighty-two days of symbiosis.

Colon bacilli.—The colon bacilli which we isolated from flask E. (neutral), no longer give the indol reaction, but still ferment lactose. The colon bacilli from flask H (acid) have preserved their properties (gas, indol, etc.).

Typhoid bacillus.—Presents the same characteristics as after the five days' symbiosis, both in the case of flasks E and H.

October 19, seventh planting.—Colonies can be detected after six days.